

signs of much activity of late. First we hear of a small planet detected by M. Perrotin at Toulouse, on January 29, position at 10h. in R.A. 8h. 43m. 13s. N.P.D. $71^{\circ} 41'$ twelfth magnitude, which appears to have been independently discovered by Herr Palisa at Pola, on February 1: by an observation at Pola, January 27, it seems this object is not to be confounded with *Rhodope*, No. 166, of which a corrected ephemeris is given in the *Circular* of the *Berliner Jahrbuch*, No. 84, but it is there conjectured that it may be *Urda* No. 167, found by Prof. Peters 1876, August 28. Calculating from the elements of *Urda* in *Circular* No. 64, for the time of the Berlin observation of M. Perrotin's planet on February 3, it results that with the correction $\delta M = +5^{\circ} 24' 9''$ the computed and observed longitude will agree, but there is a difference of $-1^{\circ} 38'$ from the observed latitude which, in the present case, throws doubt upon the presumed identity. Again, on February 2, M. Cottenot, at Marseilles, detected a planet, tenth magnitude, position at 13h. 2m. in R.A., 10h. 2m. 29s. N.P.D., $78^{\circ} 51'$, which was also found by Prof. Peters at Clinton, U.S., on February 4; this object is probably new. Finally, on February 6, Prof. Peters met with another planet, also of the tenth magnitude, in R.A. 10h. 16m. N.P.D. $76^{\circ} 17'$, which he notified to the Paris Observatory through the Smithsonian Institution by cable; it is probable, however, that the presence close to this position of his previously-discovered planet *Antigone*, No. 129, has escaped his attention, and as its brightness would also be about equal to that of stars of the tenth magnitude, it is most likely to be the object observed.

The number of minor planets appears now to have reached 180, and possibly 181.

The Supplement to the *Berliner Jahrbuch*, for 1880, contains ephemerides for the present year, of the small planets to No. 172 inclusive, excepting only *Dike* and *Scylla*, for which the necessary materials are not available. Polyhymnia in opposition on August 30, in 11° S. declination, is distant from the earth 0.88; *Atalanta* in opposition October 27, declination 37° N., is distant 0.98, and *Felicitas* in opposition November 11, declination 30° N., is distant 0.92; these are the three cases of nearest approach during the year. Of the minor planets discovered since 1845, *Hebe* attains the greatest brightness — 7.4 m. in the middle of November, 1878, while in the neighbourhood of ϵ Eridani.

METEOROLOGICAL NOTES

ATMOSPHERIC MOVEMENTS.—A first paper on this subject, by Mr. Ferrel, has been published by the United States Coast Survey Office, in which the inquiry is limited to an investigation into the mechanics and general motions of the atmosphere which are dependent on wide-spread and periodically-recurring disturbances. In consideration of the enormous difficulties in the way of investigating the effects of friction, the author adopts the only course open to him, viz., to introduce unknown functions into the equations representing the resistances from friction in the direction of the co-ordinates, leaving these to be determined approximately from a comparison of the final results deduced from the equations with observation. From a mathematical examination of the question it is concluded that in whatever direction a body moves upon the surface of the earth, there is a force arising from the earth's rotation tending to deflect it to the right in the northern but to the left in the southern hemisphere; and that this deflecting force is exactly the same for motions in all directions, so that if any sensible effects of this sort arise in the case of rivers or of railroads running north or south, the very same effects must take place where they run east or west or in any other direction. The amount of this deflecting force is exactly double of that which is obtained in accordance with the principle adopted by Hadley. An

elaborate examination is made of the distribution of temperature over the earth, the most important of the results being that the mean temperature of the whole surface of the earth is $60^{\circ} 2'$, the mean for the northern hemisphere being $59^{\circ} 5'$, and that for the southern hemisphere $60^{\circ} 9'$. With reference to this result Mr. Ferrel remarks that if important data collected by Dr. Hann for the extreme southern latitudes had been at hand while he was engaged with the investigation, the results obtained for the mean temperatures of the two hemispheres might have been nearly equal. This result, which is essentially different from the commonly received opinion, has, it is obvious, important bearings on many questions of terrestrial physics. The distribution over the globe of atmospheric pressure is similarly examined with results of great importance in their relations to meteorological theories. The coefficient of the annual inequality of pressure in North America amounts to only about one-third of that of the interior of Asia, from which the important conclusion is drawn that the difference between Asia and America in this respect does not depend so much upon the difference in the extremes of temperature of the two continents, which is inconsiderable, as upon the difference in the extent of the two continents. The annual maximum of barometric pressure for the United States, except the Pacific coast, occurs about December 23, which is about sixteen days earlier than in Europe. In both continents the time is considerably earlier than the time of the minimum of temperature. The distribution of temperature and pressure and the prevailing normal winds of the globe are shown on seven well-executed maps. In succeeding papers Mr. Ferrel intends to investigate those disturbances in the distribution of temperature and humidity which are of a comparatively local character, and which result in the locally developed phenomena of cyclones and other storms; and finally to apply the principles of atmospheric mechanics thus developed to the explication of oceanic currents.

CLIMATE OF INDIA.—We notice in a recent number of the *Izvestia* of the Russian Geographical Society, an interesting paper by M. Wojekoff, being a sketch of the climate of India according to the recent works of Mr. Blanford, the reports of Mr. Wilson, and some notes taken by the author during his recent visit. M. Wojekoff describes very clearly the main features of the climate, and accompanies his description by some tables which illustrate the prevailing and characteristic directions of the winds. Besides, by a comparison of the temperatures of some places in India and South America, situated the one in parts devoid of forests, and the others in places where the forests are yet preserved, M. Wojekoff shows what a great influence forests have on climate, and he arrives at the conclusion that the absence of great heats and a continuous humidity of air are always met with at those places which, however far from sea, are situated in forest lands. He concludes, therefore, as to the importance of preserving the forests in India, and expects that detailed observations would yet more show their importance as well as the beneficent influence of the irrigation on climate.

LOW BAROMETRIC READING IN THE HEBRIDES, NOVEMBER 11, 1877.—We have received from Mr. Buchan, Scottish Meteorological Society, a communication on this subject. The following readings of the barometer, reduced to 32° and sea-level, were made by Mr. Youngclaus, the Society's observer, at Monach Lighthouse ($57^{\circ} 31' N. lat.$, $7^{\circ} 42' W. long.$), on November 11, at 9 A.M., 28.330; 11 A.M., 28.120; 12.43 P.M., 28.008; 1.30 P.M., 27.912; 4.20 P.M., 27.861; 8 P.M. and 9 P.M., 27.752; and at 9 A.M. of the 12th, 27.968; and at 12.43 P.M., 28.038 inches. Thus for nearly twenty-four hours the barometer at this place was under 28.000 inches, and fell to 27.752 inches, the observer remarking that the rise which followed proceeded at a very slow rate.

At Monach, on November 15, at 12.43 P.M., the barometer was 29.703; 9 P.M., 29.051; 11 P.M., 28.807 inches; after which it began to rise, and at 9 A.M. of the following morning it had risen to 29.828 inches, a fluctuation of nearly two inches having taken place during the twenty hours ending 9 A.M. of the 16th. The storm accompanying this depression of the barometer rose at 10.30 P.M., about the time of lowest pressure to the force of a true hurricane, the worst the observer had ever seen during his twenty years' service as a lightkeeper. At the same dates, at Thorshavn, Farø, the readings of the barometer were—lowest at midnight of the 11th, 28.119 inches; 15th, at 9 A.M., 29.002 inches, and at 9 P.M., 29.350 inches, the barometer thus rising a third of an inch in Farø during the time that it fell about an inch in the outer Hebrides, accompanied by a storm of extraordinary violence, being the heaviest storm experienced in the north-west of Scotland generally for very many years.

CUMULATIVE TEMPERATURES.—To simplify the difficulty of obtaining sums of temperature (a highly important climatological factor, particularly in its application to agriculture) for any district, from the ordinary instruments, M. von Sterneck has recently proposed to obtain these indirectly by observation of the sums of actions produced by the temperature. A suitable apparatus for this we have in the pendulum-clock. The course of this represents the sums of the heat-changes, since it represents the sum of the changes of length of the pendulum, produced by different temperatures, which changes cause variations in the time of oscillation. As the laws of pendulum vibrations and the expansion of substances through heat are known, the true sums of temperature can be deduced from the going of the clock. While the watch-maker is concerned to obtain as uniform working as possible, and uses arrangements to compensate the changes in length of the pendulum, the present case requires that these changes should be brought into prominence; so the pendulum is made of some substance (like zinc) which expands greatly through heat. The clock will reveal the variations of temperature by its slowness or fastness, and by comparing its indications, at certain times, with those of a uniformly-going clock, the sum of divergences of the temperature from any given temperature will be ascertained. The principle of this method can also be applied (as the author shows) to determine the variations in atmospheric pressure and in the intensity of magnetism.

GEOGRAPHICAL NOTES

BRAZIL.—Mr. Herbert H. Smith has returned to Baltimore, U.S., after an absence of several years employed in scientific explorations in Brazil. Leaving the United States in January, 1874, for Pará, he ascended the Amazon to Santarem, where he was engaged for two years in collecting and studying the insect fauna of that region. Subsequently he extended his explorations to the north side of the Amazon and on the tributary rivers, as far as the base of the great northern table-land. A collection of insects made by him during this period amounted to 12,000 species, with 100,000 specimens, accompanied by copious notes on the habits, geographical distribution, &c. During 1876 and the early part of 1877 he was connected with the Brazilian Geological Commission in examining the geological structure of the country. He succeeded in making a section of the Devonian rocks of the Amazon region, and discovered a rich carboniferous bed on the north side of the Amazon, in the vicinity of Alenguer. The results of this labour are in the course of publication by Prof. Hartr, of the Geological Survey. Several months of his absence were spent in the southern part of Brazil, near Rio de Janeiro and Minas. Mr. Smith has been able to make some interesting inferences in regard to the geological distribution of Brazilian animals. Bates and

Wallace have pointed out that the Amazon forms a limit to the migration of many animals. Mr. Smith is of the opinion that the flood plains of the valley, which average forty miles in width, constitute a far more effectual barrier than a body of water of the same breadth. Birds and insects of powerful flight pass this distance without difficulty, and are generally found on both sides; but the sluggish species, especially the wingless forms, like spiders, are generally confined to one side or the other. This is especially shown in those hymenopterous species in which the females are wingless, as the mutillaries, pezomactri, &c. Here the distinction between the northern and southern groups is very striking. The broad alluvial belt through which the Amazon flows constitutes a very distinct zoological province, in which many of the forms appear to have been derived from those of the high land. The contributions of Mr. Smith to geographical knowledge have not been inconsiderable. His maps of the physical geography of the Lower Amazon and of three important tributaries, the Curna, the Mæcurú, and the Jaurucú, are especially noteworthy. The last-mentioned has been entirely lost sight of by modern geographers, though referred to by earlier travellers. This enters the delta of the Xingú close to the Amazon, and is apparently navigable for steamers to a distance of 150 miles from its mouth. Mr. Smith returns to the United States for the purpose of making arrangements for continuing his explorations for several years longer, so as to accumulate a sufficient body of facts to work out satisfactorily the entire problem of the derivation and the geographical distribution of the insects of Brazil.

AFRICA.—Herr Schütt, who has been despatched by the Deutsche afrikanische Gesellschaft to equatorial Africa, has safely arrived in San Paul de Loando, and starts at once for the interior to complete the work of exploration commenced by Eduard Mohr, whose untimely fate we lately recorded. The series of geographical lectures in Berlin, delivered under the auspices of the Afrikanische Gesellschaft, was opened on January 23, by Dr. Nachtigal, who gave a graphic description of the African kingdom Darfur, which was conquered in 1874 by the Egyptians.

ARCTIC EXPLORATION.—We learn from *L'Explorateur* that Mr. Gordon Bennett, of the *New York Herald*, intends to equip an expedition for polar exploration.

THE ANGARA.—At its last meeting, February 5, the Section of Physical Geography of the Russian Geographical Society discussed the question of the expedition to be sent for the exploration of the Angara and of the water-divide between the Obi and Yenisei rivers, where, it is expected, a water communication could be established between the two main rivers of Siberia. An elaborate report was read, being a sketch of the present state of our knowledge of these tracts, and of the recent explorations of the water-divide; the route the expedition will have to follow was also discussed.

AN AZIMUTH INSTRUMENT.—Capt. Mouchez has presented to the Geographical Society of Paris a portable instrument for taking azimuths and altitudes in travelling. The weight is only a few pounds, and the experiments made at Montsouris show that the latitude can be taken with an error of a few minutes. This instrument is to be used by some travellers that the Paris Geographical Society is sending out to Africa. A single man can carry the apparatus and use it without losing much time. A complete observation requires less than a quarter of an hour.

NOTES

At the meeting of the Linnean Society on Thursday last, it was unanimously resolved to send a congratulatory letter to von Siebold on the occasion of his jubilee. This graceful act, however, brings into prominence the neglect of the Society to take